ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 2 - Applied Research

PE NUMBER AND TITLE: 0602308A Advanced Concepts and Simulations

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	19660	21494	24955	24799	25007	38546	44020	48975	Continuing	Continuing
AC90 Advanced Distributed Simulation	9341	8407	10291	10495	10545	10714	12079	12683	Continuing	Continuing
AC99 Advanced Concepts & Technology	10319	10603	14664	14304	14462	14453	17694	20609	Continuing	Continuing
AD01 Photonics Research	0	2484	0	0	0	0	0	0	0	2484
A636 Army After Next Applied Research	0	0	0	0	0	13379	14247	15683	Continuing	Continuing

A. Mission Description and Budget Item Justification: Work in this program element (PE) advances development and use of modeling and simulation, including Advanced Distributed Simulation (ADS), related to Army-specific experiments/demonstrations and industry participation at the U. S. Army Training and Doctrine Command (TRADOC) Battle Labs, Army's Force XXI, and Army After Next experiments. It develops standards, architecture and interfaces essential to realizing the DoD/Army vision of creating a verified, validated and accredited synthetic "electronic battlefield" environment. The electronic battlefield is used to investigate and demonstrate new warfighting concepts including development of tactics, doctrine, training techniques, soldier support, systems and system upgrades. It directs and stimulates advances in those technologies required for real time interactive linking within and among constructive, virtual and live simulation.

Simulation Training and Instrumentation Command (STRICOM) located at Orlando, FL is responsible for Project AC90. Work is performed by the broadest range of the nation's industrial and academic communities. Contractors include: Natural Selection, La Jolla, CA; Acusoft, Orlando, FL; Pathfinder Systems, Lakewood, CO; SAIC, San Diego, CA; University of Central Florida, Institute for Simulation and Training, Orlando, FL; Veda Incorporated, Orlando, FL; Perceptronics, Inc., Woodland Hills, CA; Lockheed Martin, Orlando, FL.

The Army Research Office-Washington, Alexandria, VA is responsible for Project AC99. Work is performed by the broadest range of the nation's industrial and academic communities. This project supports the Advanced Concepts and Technology (ACT) II Program. ACT II uses a yearly Broad Agency Announcement (BAA) to industry and academia, and provides a low overhead, timely mechanism for the demonstration of mature, commercial off-the-shelf (COTS) technologies, prototypes, software, and /or systems for assessment by the TRADOC Battle Labs. Contractors include contractors: Center for Photonics Research, Boston, MA; Chain Reactions, Gold River, CA; FFE International, Alexandria, VA; Harris Corporation, Rochester NY; Hughes, Tucson, AZ; Lockheed Martin, Pomona, CA; Lockheed Martin, Dallas, TX; Lucent Technologies, McLeansville, NC, Boeing, Huntington Beach, CA; McDonnell Douglas, Huntsville, AL; Mobile Datacom, Clarksburg, MD; Monterey Bay, Columbia, MD; Morris Brown College, Atlanta, GA; Mystech Associates, Falls Church, VA; Northrop Grumman, Baltimore, MD; Research Triangle Institute, Research Triangle Park, NC; Rolands & Associates, Monterey, CA; Syracuse Research, Syracuse, NY.

The Photonics Research project funds research conducted at the Boston University Photonics Center. This project is a Congressional add in FY 1999.

Future efforts for these projects will be performed by a broad range of contractors selected in response to the Broad Agency Announcement (BAA) process. These programs are fully coordinated with the other Army applied research exploratory development programs, Defense Advanced Research Projects Agency (DARPA), Defense Modeling and Simulation Office, TRADOC and DoD Project Reliance agreements on conventional air/surface weaponry, with oversight provided by the Joint Directors of

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Laboratories. Work in these projects are related to and fully coordinated with efforts in PE 0604715A (Non-System Training Devices - Engineering Development). There is no duplication of effort within the Army or Department of Defense.

B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 1999 PB)	20339	27981	31552	34427
Appropriated Value	21059	21653		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-720	-159		
b. SBIR / STTR	-511			
c. Omnibus or Other Above Threshold Reductions				
d. Below Threshold Reprogramming				
e. Rescissions	-168			
Adjustments to Budget Years Since FY 1999 PB			-6597	-9628
Current Budget Submit (FY 2000 / 2001 PB)	19660	21494	24955	24799

Change Summary Explanation: Funding – FY 1999 – Congressional reduction to PE (-6328).
FY 2000/2001 – Funds reprogrammed to higher priority requirements.

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PROJECT: AC90

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AC90 Advanced Distributed Simulation	9341	8407	10291	10495	10545	10714	12079	12683	Continuing	Continuing

Mission Description and Justification: This program provides and demonstrates enabling technologies for advancing Distributed Interactive Simulation (DIS) in the synthetic environment and the representation of the battlefield needed to support the use of modeling and simulation as an acquisition tool and training in the era of reduced funding. Efforts in this project support the Battlefield Distributed Simulation-Developmental (BDS-D) program. BDS-D will provide virtual representation of a lethal combined arms environment with the warfighter-in-the-loop that closed-form analysis cannot provide. The environment permits new system concepts, tactics and doctrine and test requirements to be evaluated with a warfighter-in-the-loop in a combined arms battlefield throughout the acquisition life cycle at a reduced cost and time compared to the traditional approach. The research being conducted includes Semi-Automated Forces (SAF), simulation interface and linkage technologies, and complex data modeling and interchange.

FY 1998 Accomplishments:

- 791 Performed experimentation to assess scalability limitations inherent in current and next generation architectures; expanded non-rule based intelligent behavioral capability to take into account capabilities, constraints, and purpose.
- 1400 Provided and demonstrated the capability to fully immerse the live individual combatant in the synthetic environment, to include control of Semi-Automated Forces (SAF) through voice and gesture recognition. Developed an improved dismounted infantry SAF, to include Military Operations in Urban Terrain (MOUT) behaviors.
- 2500 Developed and prototyped Embedded Simulation (ES) modular hardware and software common components. Prototyped virtual-live interactive system. Linked STRICOM ES test bed with TACOM VETRONICS Systems Integration Laboratory (VSIL) and CECOM Digital Integrated Lab (DIL).
- 4650 Developed and enhanced the synthetic environment to support a corps-sized battlefield. Developed and evaluated open object-oriented architecture, including methods for model definition and VV&A of networked simulations. Continued standards development/testing, expanded terrain data base work, and evolved/refined data collection and analysis.

Total 9341

FY 1999 Planned Program:

- 849 Address CGF (Computer Generated Forces) system architectural composability. Demonstrate advanced behavioral technology.
- 2500 Tailor and integrate standard ES components to Future Scout and Cavalry System (FSCS) ATD program. With TRADOC, develop prototype training scenarios and databases.
- 3132 Develop and enhance the synthetic environment to support an Echelon Above Corps (EAC) sized battlefield. Develop and evaluate open object-oriented architecture, including methods for model definition and VV&A of networked simulations.
- 925 Develop the Advanced Tactical Engagement Simulations (A-TES) framework with virtual integration capability and authoritative information center.

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	PROJECT AC90

FY 1999 Planned Program: (continued)

•	800	Develop a prototype capability for individual and small unit synthetic forces that represent doctrinally correct Army behaviors.
	201	Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs
Total	8407	

FY 2000 Planned Program:

•	980	Implement the Advanced Tactical Engagement Simulations (A-TES) framework with simulation-intensive R&D of soldier-fired indirect fire weapons.
•	2500	Support TARDEC with in-vehicle High Level Architecture (HLA) experiments using Vehicle Electronics Suite.
•	846	Develop intelligent behavioral implementations and demonstrate significantly increased capabilities for scaleable and configurable CGF representation.
•	5165	Demonstrate common tools and capabilities for High Level Architecture (HLA) and Synthetic Environment (SE).
•	800	Develop prototype dismounted soldier virtual environment night vision/sensor capability.
Total	10291	

FY 2001 Planned Program:

•	980	Enhance the Advanced Tactical Engagement Simulations (A-TES) virtual integration testbed with hybrid simulation and hardware-in-the-loop experiments.
•	2500	Demonstrate an Embedded Simulation System (ESS) using a brass board vehicle surrogate at the National Training Center.
•	870	Study intelligent behavioral approaches. Demonstrate prototype capabilities and address technology transfer and implementation issues.
•	5245	Demonstrate common tools and capabilities for High Level Architecture (HLA) and Synthetic Environment (SE).
•	900	Develop prototype dismounted soldier virtual environment gesture recognition system. Evaluate effectiveness of night operations simulation.
Total	10495	

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BUDGET ACTIVITY: 2 - Applied Research

PE NUMBER AND TITLE: 0602308A Advanced Concepts and Simulations

PROJECT: AC99

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AC99 Advanced Concepts & Technology	10319	10603	14664	14304	14462	14453	17694	20609	Continuing	Continuing

Mission Description and Justification: This project supports the Advanced Concepts and Technology (ACT) II Program. It evaluates new concepts through soldier in the loop, constructive and virtual simulations electronic battlefield demonstrations and field tests, and modeling and simulations in real time. Specific areas of interest include: battlespace management and battlefield synchronization, depth and attack operations, lethality, survivability and mobility; command, control, communications, and computers (to include interoperability); force sustainment; and doctrine and leader development. All projects support and complement the Army computer technical architecture tenets. The Act II goal is to advance a need from concept to demonstration to the soldier in one year. ACT II uses a yearly Broad Agency Announcement (BAA) to industry and academia, and provides a low overhead, timely mechanism for the demonstration of mature, commercial off-the-shelf (COTS) technologies, prototypes, software, and /or systems for assessment by the TRADOC Battle Labs.

FY 1998 Accomplishments:

- 10319 Conducted demonstrations and experiments in support of the Army Training and Doctrine Command's Battle Labs:
  (1) In response to the Broad Agency Announcement to industry and academia, and after a very competitive selection process, awarded 19 ACT II projects from fourteen states. These projects demonstrated the highest potential to enhance warfighter capabilities.
  (2) Projects included enhanced combat identification, tele-maintenance, force protection, communications, and logistics tracking initiatives. Industry/academia participants include Northrop Grumman, California; Boston University, Massachusetts; Microvision, Washington; Oshkosh Trucks, Wisconsin; Research Triangle Institute, North Carolina; Kaiser Electronics, California; ITT Aerospace, Indiana; and Optimetrics Inc., Maryland.
  (3) Analyzed and evaluated the results of FY 1997 efforts; identifying candidates for streamlined acquisitions or follow-on test and evaluation.
  (4) Continually upgraded management controls with the goal of identifying further efficiencies in the process.

Total 10319

FY 1999 Planned Program:

- 10322 Conduct demonstrations and experiments in support of Battle Labs.
  This effort includes the following activities:
  (1) Supervise, integrate, and approve the Broad Area Announcement (BAA) Topics for new ACT II projects. Ensure that these topics facilitate proposals which meet the criteria of the program: mature, COTS technology which addresses specific warfighter requirements. Ensure widest dissemination of the BAA throughout the industrial and academic communities.
  (2) Selected proposals which were technically feasible, offered the best potential return on investment, and fulfilled a specific Army requirement. Projects included less-than-lethal munitions for peace keeping operations, advanced communications prototype, night vision system, integrated command bridge system, and advanced computing capabilities. Industry/academia participants include Colt Manufacturing, Connecticut; Northwestern University, Illinois; CANVAS Corp., Florida; Sperry Marine Inc., Virginia; Boeing/McDonnell Douglas Corp.; and Litton Systems Inc., California.

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	PROJECT AC99

FY 1999 Planned Program: (continued)

(3) Analyze and evaluate FY98 projects for follow-on test and evaluation.
(4) Continue to streamline management controls for efficiencies in the process.

- 281 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 10603

FY 2000 Planned Program:

- 14664 Conduct demonstrations and experiments in support of Battle Labs.
  This effort includes the following activities:
  (1) Release BAA to solicit Battle Lab related concepts and technologies from the nation's industrial and academic communities.
  (2) Select, within resource constraints, high payoff and innovative efforts for demonstration of warfighting capabilities.
  (3) Analyze and evaluate the results of FY 1999 efforts; identifying candidates for streamlined acquisitions.
  (4) Approve BAA topics for new ACT II projects to satisfy future Army and DoD needs not being addressed by existing programs.

Total 14664

FY 2001 Planned Program:

- 14304 Conduct demonstrations and experiments in support of Battle Labs.
  This effort includes the following activities:
  (1) Release BAA to solicit Battle Lab related concepts and technologies from the nation's industrial and academic communities.
  (2) Select, within resource constraints, high payoff and innovative efforts for demonstration of warfighter capabilities.
  (3) Analyze and evaluate the results of FY 2000 efforts; identifying candidates for streamlined acquisitions.
  (4) Approve BAA topics for new ACT II projects to satisfy future Army and DoD need not being addressed by existing programs.

Total 14304

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PROJECT: AD01

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
AD01 Photonics Research	0	2484	0	0	0	0	0	0	0	2484

Mission Description and Justification: This Congressional add project supports photonics research at the Boston University Photonics Center for Army smart imaging and communications applications. Key areas include magnetic and optical devices, silicon micromechanical optical components, and bio-photonic materials. Development of these materials and technologies, which have application in communications, data modulation, optoelectronics, and optical control of microwaves, will be leveraged with commercial developments and, as a consequence, drive the costs for components and devices lower. Significant Army applications include technology for night vision and imaging equipment and devices to enable communications while on-the-move.

FY 1998 Accomplishments: Program not funded in FY 1998.

FY 1999 Planned Program:

•	2418	Conduct research in magnetic and optical devices, silicon micromechanical optical components, and bio-photonic materials at the Boston University Photonics Center.
•	66	Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	2484	

FY 2000 Planned Program: Program not funded in FY 2000.

FY 2001 Planned Program: Program not funded in FY 2001.

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